DOCUMENT RESUME

ED 037 365 SE 008 201

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TITLE Observing, The Basis of Science, 1st Experimental Edition.
INSTITUTION Texas Univ., Austin. Research and Development Center for Teacher Education.; Texas Univ., Austin. Science Education Center.
PUB DATE [70]
NOTE 44p.

EDRS PRICE EDRS Price MF-$0.25 HC-$2.30
DESCRIPTORS Behavioral Objectives, Elementary School Science, *Elementary School Teachers, Instructional Materials, *Science Activities, *Teacher Education, *Teaching Guides

ABSTRACT

Objectives for this module include the ability to: (1) describe properties of an object or event using all five of their senses; (2) construct statements that are observations and inferences. The population for which this instructional program has been found to be effective includes preservice and inservice elementary school teachers who teach science. An underlying purpose of this module is to broaden the observing techniques of the teacher and to sharpen and extend the range and perception whereby he can become more cognizant of more features of his environment. The estimated time periods required for this instructional module includes three hours and ten minutes for planning and 90 minutes for teaching. The instructional component of the module includes pre-appraisal, instructional activities, and post-appraisal. Non-instructional components are: objectives, rationale, references, materials list, and duplicated materials. (BR)

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OBSERVING, THE BASIS OF SCIENCE

1st Experimental Edition

The Research & Development Center
For Teacher Education

THE UNIVERSITY OF TEXAS
AUSTIN

SE 008 201

ED037365

MAR 27 1970

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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OBSERVING, THE BASIS OF SCIENCE

1st Experimental Edition

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OBSERVING, THE BASIS OF SCIENCE

David P. Butts

Science Education Center
and
The Research and Development Center for Teacher Education
The University of Texas at Austin

I. PERFORMANCE OBJECTIVES:

At the end of this session the participants should be able to:

1. Describe properties of an object or event by using all five of the senses.

2. Construct statements that are observations and inferences.

II. RATIONALE:

Observation, that is, the use of the five senses, is basic to science because it is the way we gather information. Often, we use tools such as a magnifying lens or ruler to amplify our sensory capabilities and to make our observations more accurate.

In order to explain a set of observations, we construct an inference, and in turn, test the inference by making another set of different observations.

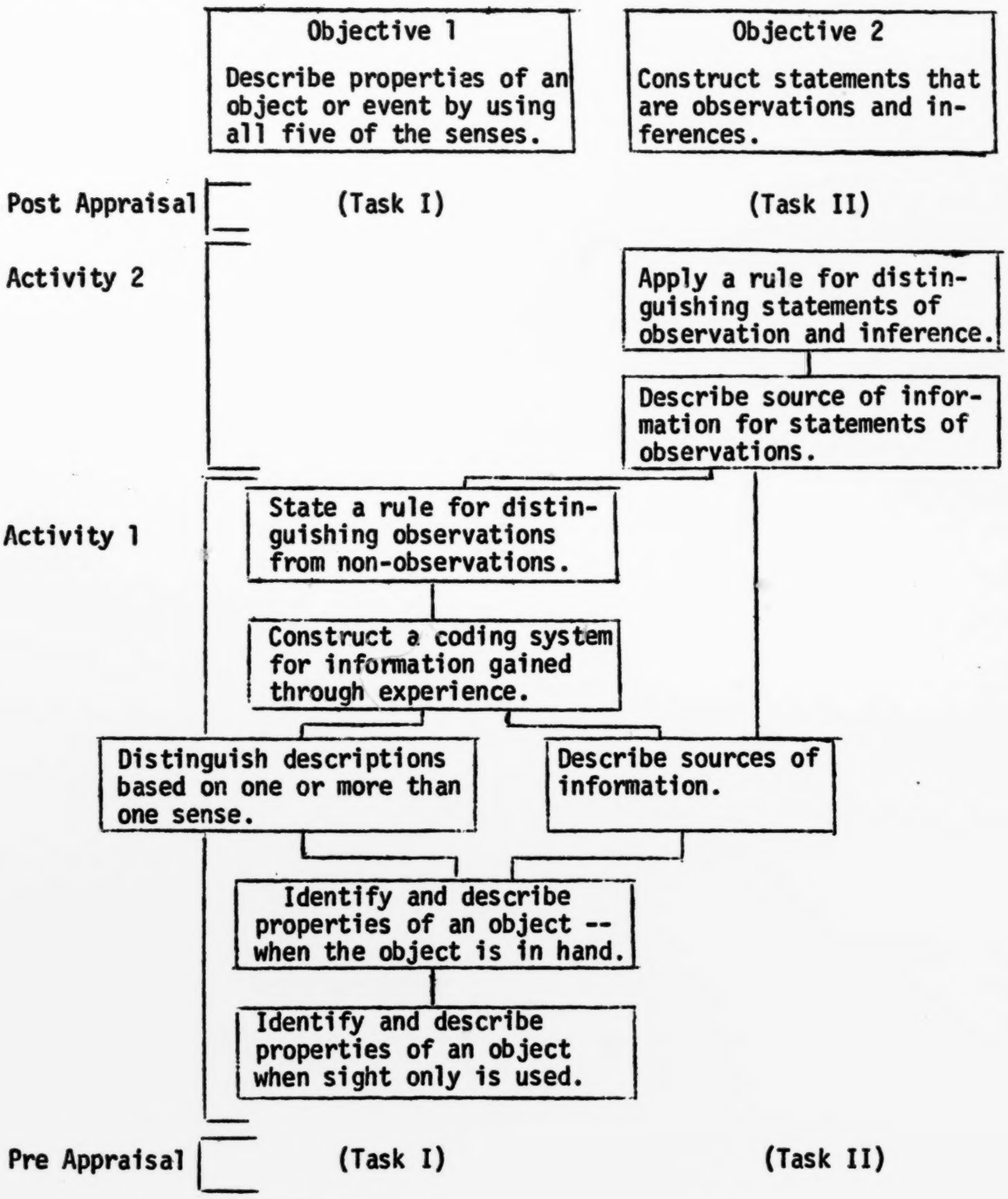
Observation is basic to communicating, predicting, measuring, classifying, and constructing graphs.

Although observation is fundamental to the work of the scientist, it is also essential to the work of the classroom teacher and is an important element in the intellectual development of elementary children.

The observation module is included, then, to broaden the observing techniques of the teacher; to sharpen and extend the range of perception whereby she can become more cognizant of more features of her environment.

The population for which this instructional program has been found to be effective includes pre-service and in-service elementary teachers who teach science.

The instructional activities of the module are based on this sequence:


Objective 1
Describe properties of an object or event by using all five of the senses.
Objective 2
Construct statements that are observations and inferences.
Post Appraisal
(Task I)
(Task II)
Activity 2
Apply a rule for distinguishing statements of observation and inference.
Describe source of information for statements of observations.
Activity 1
State a rule for distinguishing observations from non-observations.
Construct a coding system for information gained through experience.
Distinguish descriptions based on one or more than one sense.
Describe sources of information.
Identify and describe properties of an object -- when the object is in hand.
Identify and describe properties of an object when sight only is used.
Pre Appraisal
(Task I)
(Task II)

The general pattern of instruction in this module is one of presenting the situation with as little instructor-direction as possible. After the participant has generated data, then the sequence provides illustrations of how the instructor could guide the discussion toward a meaningful interpretation of the data gathered.

Because of the diagnostic data available in the pre-appraisal experience, it is possible to determine which instructional sequence appears to be most appropriate for which student. Experience indicates that if 80 percent of a group performs well on an appraisal task, the related instruction activities should be omitted. For this instructional module, this is illustrated as:

Objective	Appraisal Task	Instructional Activity
1	1	1
2	2	2

Evaluation Data:

The results of students involved in the instructional experience as described in this module are as follows:

With a group of pre-service teachers, N = 32

	Pre	Post
Task I	2	18
Task II	7	28

The time periods required for this instructional module included:

A. Planning for instruction: Median - 6 hrs.
(Range: 3 to 11 hours)

B. Teaching: Median - 90 minutes.
(Range: 35 to 150 minutes)

Suggested time periods for the module are as follows:

A. Pre-Appraisal	20 minutes
B. Activity I	40 minutes
C. Activity II	15 minutes
D. Post-Appraisal	15 minutes
Total	90 minutes

III. REFERENCES:

Commission on Science Education. Science - A Process Approach, Commentary for Teachers. AAAS Miscellaneous Publication, 65-22, 1965, pp. 33-40.

Gagne, R. M., "The Psychological Basis of Science - A Process Approach," AAAS Miscellaneous Publication, 65-68, 1965, 35 pages.

IV. MATERIALS LIST:

Pre-Appraisal	Film: The Knife Projector OB #1 (1 per participant) Objects #1 [colored construction paper, sprayed (deodorant is cheap) with fragrance] (1 per participant)
Activity 1	*Treated sugar cubes or marshmallows (1 per participant) Sheets of paper (1 per participant) Chalkboard and chalk or Chart paper and pen Rulers Matches Cups of water *To treat sugar cubes -- Place 1 oz. alum and 50 sugar cubes in paper sack. Spray deodorant or hair spray into sack. Shake gently.
Activity 2	OB #2 (1 per participant) OB #3 (1 per participant) OB #4 (1 per participant) OB #5, #6 (possibly) (1 per participant)
Appraisal	OB #7 (1 per participant) Alcohol (1 bottle) Dropper (1) OB #8 (1 per participant) Film: The Shrinking Balloon Projector

V. INSTRUCTIONAL ACTIVITIES

Pre-Appraisal (Time: Approximately 20 minutes)

(Directions: Distribute Object #1, pieces of colored construction paper which have been sprayed with deodorant and response booklet.)

1. From our environment we secure much information which we use, if the situation is right - or ignore, if other circumstances in our environment so direct. Each of you has received an object. What do you think we are going to do with it?

The purpose for this initial question is both to focus the attention of the participants on the task and to help them to begin to accept responsibility for the learning task.

2. For Task I, use the object you have, and write seven properties of the object.

Allow 3 minutes.

3. Look back at your seven items. Place a 1 for each one that you identified by use of sight; a 2 for each one that you identified by use of touch; a 3 for each one that you identified by use of taste; a 4 for each one that you identified by use of smell; and a 5 for each one that you identified by use of hearing.

Confusion and lack of agreement among participants will indicate to you that clarification is needed for this task and the activity pertaining to this task should be used with the group.

4. If you have properties identified with each of the five senses, circle Task I on your Appraisal Sheet.

(Directions: Show film)

5. You have just seen a filmed episode. Based on what you have seen, for Task II please construct two statements of observation and two statements of inference.

Allow five minutes for this task. Notice the participants' ease or lack of ease in performing the task.

6. Please pass your paper to the person next to you, so no one has his own paper. Check the paper you now have. If you agree with the classification of the four statements, circle Task II. If you do not agree, note which statement you question and discuss this with the author.

Activity 1 (Instruction time: Approximately 40 minutes)

Objective 1: Describe properties of an object or event by using all five of the senses.

(Directions: Arrange several treated sugar cubes before the participants where they can only <u>see</u> them.)

7. Here is a set of objects. Write down four things about them.

8. Draw a horizontal line on your paper and under it write the name of this object.

(Directions: Now give each of the participants one of the treated sugar cubes and have rulers, matches, cups of water available at tables.)

9. Write down seven more things about this object.

You may need to give them a five or six minutes time limit.

10. In what way was your first list different from your second list?

The participants should note that the first list was based on what they could see and what they could remember about similar objects. The second list was based on first hand experience using several of the senses.

11. What did we use to gather information about this object?

Two things--our senses and our past experience--to describe, compare, reason, and organize to investigate--or the processes which are on the transparency, "Observing to Experimenting."

12. Each one give me one of the statements you made in your second list.

After you have listed about 20 of these on the chalkboard, you may wish to start the coding activity.

13. Which of these statements is a description of a property of the object based on the use of sight only?

It may be necessary to have the group define what is meant by property--that is, characteristic. Such statements might be, "it looks white;" "it has edges;" "it sparkles." Code these statements with the numeral 1.

14. Which is a statement of a property identified by the sense of touch? Code with the numeral 2.

Such statements as "it feels rough;" "it feels hard."

15. Code statements for sense of taste with numeral 3, smell with numeral 4, hearing with numeral 5.

Usually most of the participants will have statements using four of the five senses. Few listened to the object and few will have statements based on listening to the object. Perhaps they expected to learn nothing from listening to the object because of their past experience.

Some statements may have more than one numeral, since the same observation may come from different senses.

16. Let's code the statements on the board with the five numerals. Now, are there any statements without a numeral? Why is this?

At this point, the uncoded statements will usually be those that are <u>more than</u> observable properties of the object. They may be description of changes or changes that one might expect to see (prediction), or they may be statements of comparison (measurement) or statements of categories (classification) or statements of explanation (inferences).

(Directions: Pick out one of the uncoded descriptions of <u>change</u>. Repeat it to the group.)

17. Why did you not want to code it with 1, 2, 3, 4, or 5?

The usual reason is that the statement required them to use something <u>more</u> than just their five senses. Many of these

types of statements will be included in the group of four statements they first wrote down.

18. Many times we can make descriptions of change. Code with a numeral 6 each statement of change.

"It burns;" "it breaks off" may fit this category. You may wish to note with the participants the difference between "It breaks off" as a statement of observed change and "It will break off" as a statement of expected change (or as used in this class, a statement of prediction). The statement, "It dissolves," may be intended to be a description noting that the object was there and has disappeared, or it may be intended as a statement in which the individual is explaining why the object was there and no longer is. It is most important to ascertain the intent of the participant's statement.

19. Now let's code our quantified observations with a numeral 7.

A quantified observation includes both counting and comparisons using numbers, for example: "It has six sides;" "It is about 1/2 cm on the edge." These are statements about the object which count or use a comparison with another object and the amount of property being compared.

20. Are there any statements of explanation? What about a statement: "It is sweet because it is sugar"? Code these statements of explanation with the numeral 8.

Statements about the object which do not require the use of the five senses usually fall into this category. Sometimes the distinction is not clear and the statement will need a clearer description in order to determine the intent of the writer. For example, "It is sugar" is clearly a statement which fits this category--an inference. That statement, "It is white" may be considered as code 1, if the intent is to merely describe color as a property of the object based on sight;

or

"It is white may be restated "It is whiter than a piece of paper"

and coded number 7 because it is now a statement of comparison;
or
"It is white" may be restated "It is white because of the spectral composition of the light being reflected or absorbed" and thus coded number 8 because it is now a statement of inference or explanation.

Beware of the confusion that can result from the distinguishing between statements that are not clearly observations or inferences. Thinking activity in the human mind is a peculiar phenomenon. Rarely do we explicitly describe all that goes on in our verbal and written communication. The persons to whom we are communicating are thus left to guess what we mean by what we say--or have left unsaid. Knowing the intent of the author may drastically change the interpretation of his communication. It is clear that some statements are definite observations and others are inferences. There also may occur in your list statements that are somewhat in the grey area between observation (codes 1-5) and inferences (code 8). Rather than let this be a point of confusion to your group, an alternative is to take a questionable statement and restate it as more clearly an observation or inference as has been illustrated by the statement, "It is white."

21. Write down a definition of observation that will distinguish it from the other types of activities we have discussed (Codes 6, 7, 8).

This definition should permit you to distinguish between what information a person acquires through the use of the five senses and those statements that may be based on the five senses but which go beyond them. For example, an acceptable definition is: "A statement about the property of an object that is secured by use of one of the five senses."

Activity 2 (Time: Approximately 15 minutes)

Objective 2: Construct statements that are observations and inferences.

22. In what way are observations (Codes 1-5) and inferences (Code 8) alike? different?

Since there may not be a clear distinction being made by the participants between observation and inference, this activity is designed to more clearly define the act of inferring. Both observations and inferences are statements based on experience! Observations are descriptions of experiences. Inferences are explanations of experiences.

(Directions: Hand out OB #2.)

23. Consider this discussion between Mike and Andrew. What was the disagreement about?

Mike is the older brother and he and Andrew are in disagreement over how the bike got wet. They agree on the observation or description that it is wet; they disagree on the explanation of how it got wet!

24. Why did Andrew infer that it had rained?

He observed that the ground and the bike were wet.

25. Did Andrew observe the rain?

No.

26. Why did Mike infer that Mother had watered the lawn?

Same observation as Andrew had made.

27. Did Mike observe Mother watering the lawn?

No evidence in the cartoon shows this.

28. What made Andrew think that it had rained?

Prior observations have told him that rain makes the ground wet.

29. Could Mike be right when he said that Mother watered the lawn?

Yes.

30. How many of you think that Andrew is right? Why?

31. How many of you think that both are right? Why?

32. Can we decide which boy is right? Why not?

With the evidence we have here it is not possible for us to decide, based on observation.

33. Should we make further observations? Why?

Yes, we don't have enough information upon which to decide. We must make a different set of observations to check on our inferences.

(Directions: Use handout OB #3.)

34. Here is a list of statements about this page of cartoons. You will have three minutes to make your responses.

Review the acceptable responses with the participants.

(Directions: Use handout OB #4.)

35. Mike and Andrew continue their discussion. You will have five minutes to make your responses.

Review the acceptable responses with the participants. If there seems to be need for more practice, use a similar procedure with handouts OB #5 and OB #6. If, on the other hand, their performance indicates adequate competence in distinguishing between statements of observation and inference, proceed to the appraisal.

Appraisal (Time: Approximately 15 minutes)

(Directions: Use OB #7. Place 2-5 drops of alcohol on one of the hands of each participant.)

36. For Task I of our post appraisal, using the object in your hand, write seven properties of the object.

Allow three minutes.

37. Look at your seven items. Place a numeral 1 for each one you identified by use of sight, numeral 2 for each one you identified by use of touch, numeral 3 for each one you identified by use of taste, numeral 4 for each one you identified by use of smell, and numeral 5 for each one you identified by use of hearing.

Confusion and lack of agreement among participants will indicate to you what clarification is needed, and at this point, you now need to make some decisions as to what instruction needs to go on for those for whom the task is still not clear.

38. If you have a property identified with each of the five senses, circle Task I.

(Directions: Show film.)

39. You have just seen a filmed episode. Based on what you have seen and for Task II, please construct two statements of observation and two statements of inference.

Allow five minutes for this task. Note the participants' ease or lack of ease in performing the task.

40. Please pass your paper to the person next to you so that no one has his own paper. Check the paper you now have and if you agree with the classification of the four statements, circle Task II. If you do not agree, note which statement you question and discuss this with the author.

41. How many have Task I circled? How many have Task II circled?

You may wish to review the two performance objectives for this instructional sequence and how your decision as to what will follow is based on the performance of the group.

When the task is completed, give immediate feedback to the participants by providing acceptable responses. Tally the results of the group, as for the pre-appraisal. You may wish to have participants compare their own pre- and post-appraisals. If

additional help is needed, individuals may be referred to supplementary material on distinguishing observations and inferences, in the Commentary for Teachers (Science - A Process Approach), 1968, pp. 35-39, 145-155. You may wish to use the Overview of Observing (OB #8) as a basis for discussing how the task of observing can be approached in working with young children.

Duplicated Materials -- Without Answers

OB # 1

Code _____

PRE-APPRAISAL

TASK I: Using the object given you, write 7 properties of the object.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

TASK II: Based on what you have seen in the filmed episode: please construct 2 statements of <u>observation</u>;

1. _____

2. _____

Construct 2 statements of <u>inference</u>.

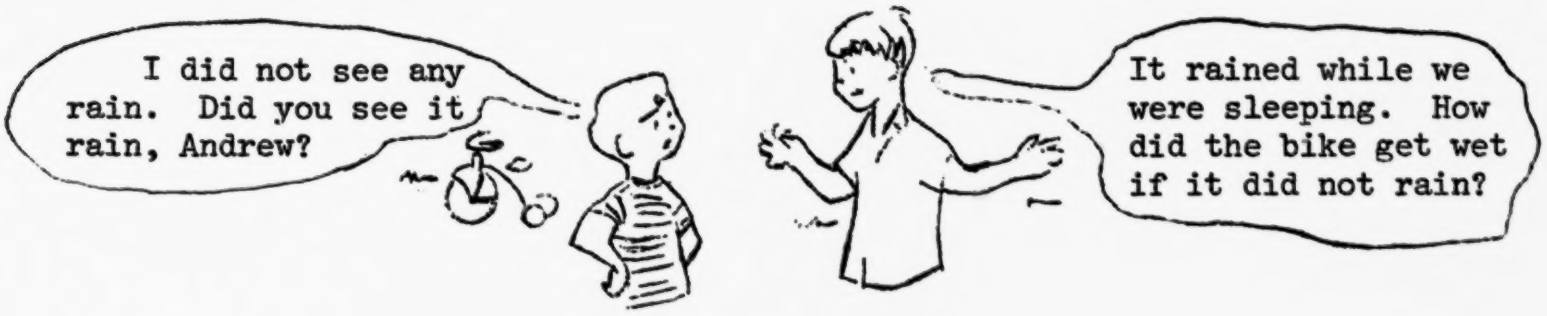
1. _____

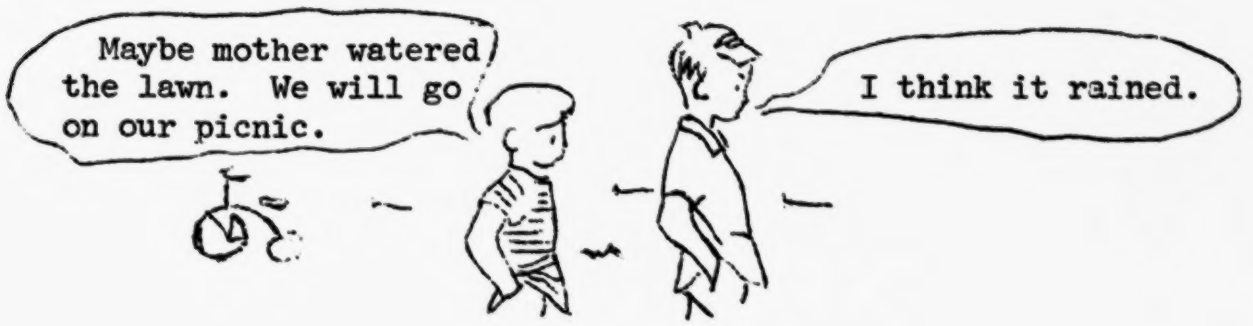
2. _____

OB #2

Code_____

Hey! Mike, the ground is wet. Your tricycle has water-drops all over it. It must have rained. We won't be able to go on our picnic.


I did not see any rain. Did you see it rain, Andrew?
It rained while we were sleeping. How did the bike get wet if it did not rain?


Maybe mother watered the lawn. We will go on our picnic.
I think it rained.

OB #3

Code_____

Which of the following statements are observations? Which are inferences? Circle O if you think the statement is an observation; circle I if you think it is an inference.

The ground is wet.	O	I
The tricycle has water drops on it.	O	I
It rained while we were sleeping.	O	I
Mother watered the lawn.	O	I

Which senses did Andrew and Mike use to make the observations?

What would you do to find out which boy is right in the inference he made?

OB #4

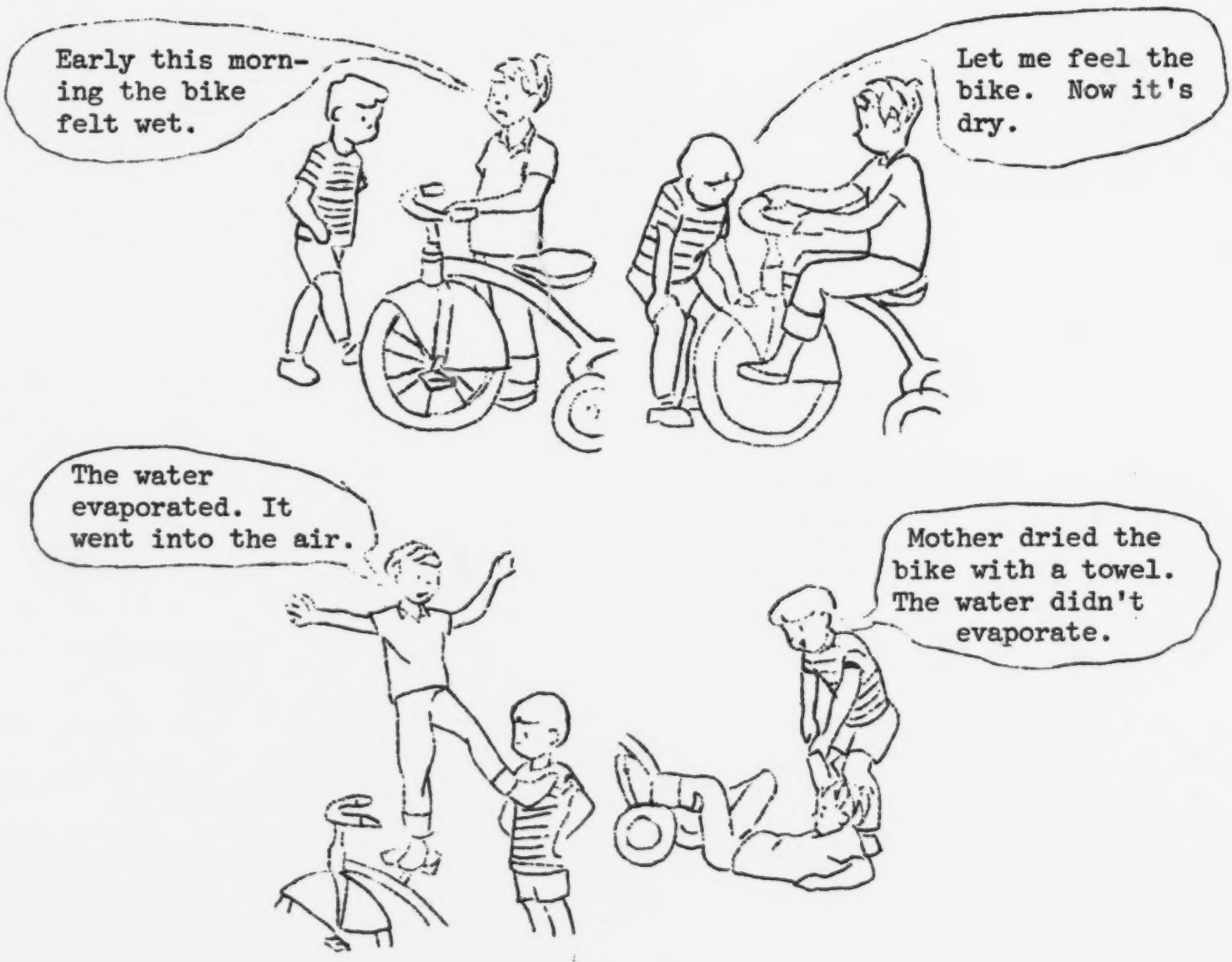
Code_____

Which statements are observations? Which are inferences? Circle O if you think the statement is an observation; circle I if you think the statement is an inference.

The tricycle felt wet.	O	I
Now it is dry.	O	I
The water evaporated. It went into the air.	O	I
Mother dried the tricycle.	O	I

What kinds of observations were made? Circle the senses used:

Seeing, smelling, feeling, hearing, tasting.


Early this morning the bike felt wet.
Let me feel the bike. Now it's dry.
The water evaporated. It went into the air.
Mother dried the bike with a towel. The water didn't evaporate.

OB #5

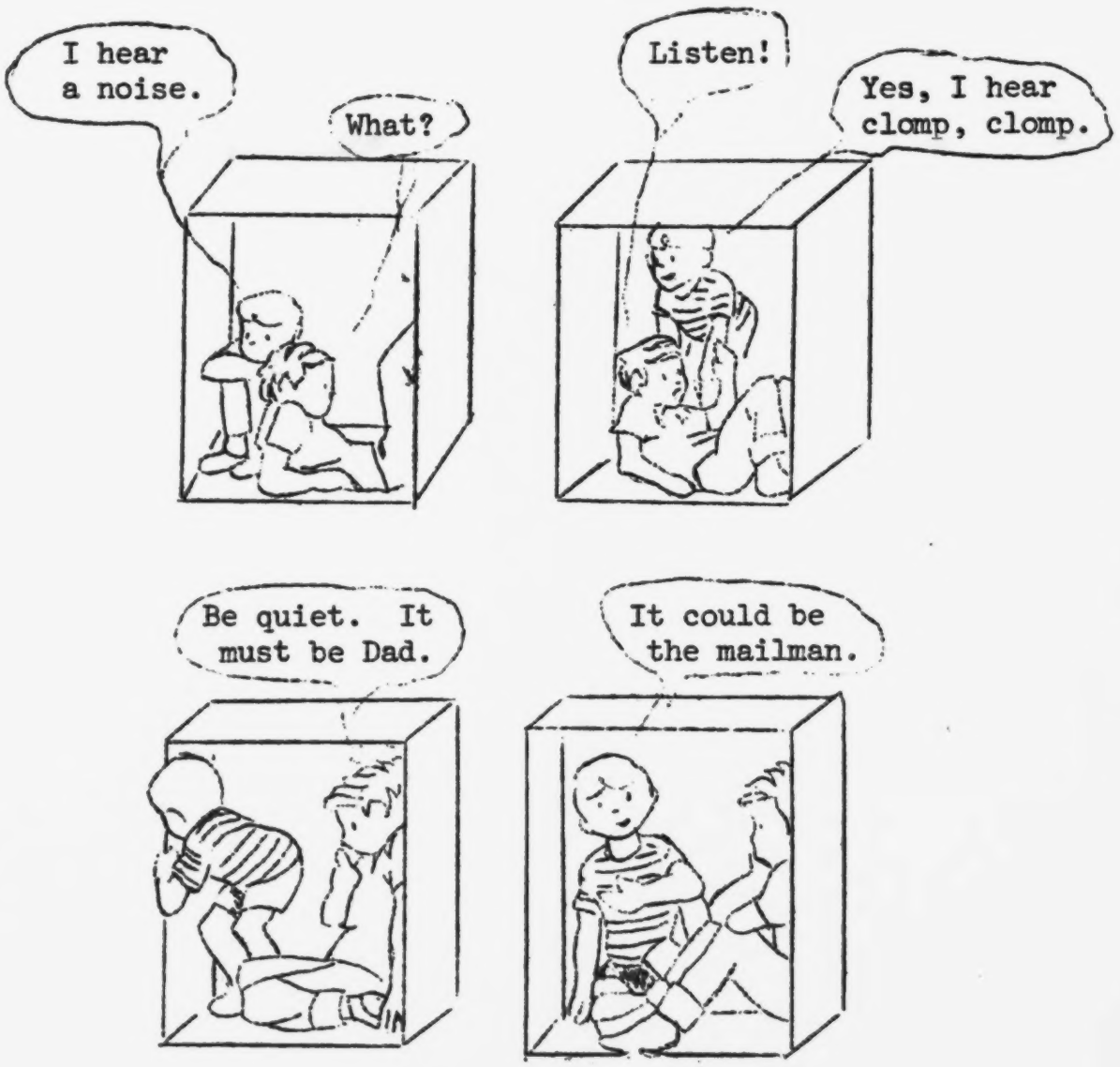
Code_____

Circle O if you think the statement is an observation; circle I if you think it is an inference.

I hear a noise.	O	I
I hear clomp, clomp.	O	I
It must be Dad.	O	I
It could be the mailman.	O	I

What kinds of observations were made? Circle the senses used:

Seeing, smelling, feeling, hearing, tasting.



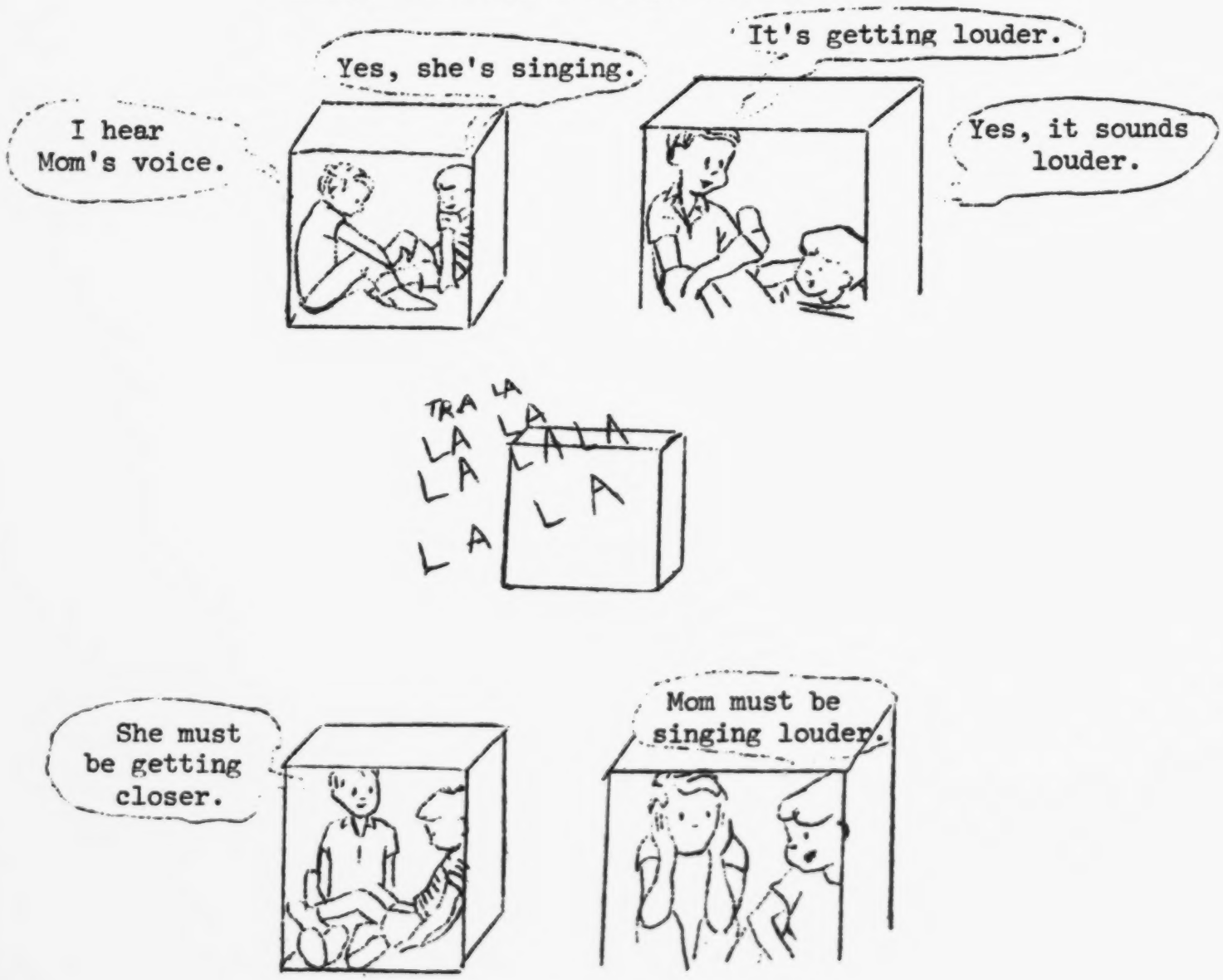
Code_____

Circle O if you think the statement is an observation; circle I if you think it is an inference.

I hear Mom's voice.	O	I
Mom is singing.	O	I
It sounds louder.	O	I
She must be getting closer.	O	I
Mom must be singing louder.	O	I

What kinds of observations were made? Circle the senses used:

Seeing, smelling, feeling, hearing, tasting.



OB # 7

Code _____

AFPRAISAL

TASK I: Using the object given you, write 7 properties of the object.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

TASK II: Based on what you have seen in the filmed episode; please construct 2 statements of <u>observation</u>;

1. _____

2. _____

Construct 2 statements of <u>inference.</u>

1. _____

2. _____

Code_____

Overview of Process of Observing
(Parts A, B, C, D are taken from 1967 Xerox)

PART A (K, 1)

Observing 1 - PERCEPTION OF COLOR

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY the following colors by sight: yellow, orange, red, purple, blue, and green.

2. NAME the three principal colors: yellow, red, and blue.

3. IDENTIFY other colors as being like one of the colors yellow, red, and blue.

Context:

Children use pieces of colored construction paper, fabric, and crayons.

Vocabulary:

Yellow, orange, red, purple, blue, green, brown, black, white (optional), gray (optional), dark, light, lighter than, darker than

Observing 2 - OBSERVING COLOR, SHAPE, TEXTURE, AND SIZE

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY and NAME two or more characteristics of a single object from the following: color, shape, size, and texture.

2. DESCRIBE a single object on the basis of color, shape, texture, and size.

3. CONSTRUCT a classification of objects on the basis of color, shape, texture, and size.

Context:

Children work with colored cubes and spheres of differing sizes and textures.

Vocabulary:

Rough, smooth, small, large, object, same, different, texture, pair, cube, sphere, group

Observing 3 - OBSERVING TEMPERATURE

Objectives:

At the end of this exercise the child should be able to

1. DISTINGUISH between two very different temperatures without the aid of a thermometer.

2. IDENTIFY and NAME temperature ranges using codes on a thermometer.

3. DISTINGUISH between the temperature in one place and that in another, using a coded thermometer.

4. DISTINGUISH between the temperature at one time of day and that at another, using a coded thermometer.

Context:

Using a thermometer scaled in colors, children describe the temperature of water and air.

Vocabulary:

Thermometer, temperature, warmer, cooler, higher, lower, earlier, cool, later, hot, cold, up, down, rise, fall

Observing 4 - PERCEPTION OF SOUND

Objectives:

At the end of this exercise the child should be able to

1. DISTINGUISH one sound as being louder than or softer than, longer than or shorter than, and higher than or lower than, another sound.

2. STATE and DEMONSTRATE that a soft sound can be heard better if the source of the sound is moved closer to the ear.

3. IDENTIFY a sound as being more like one of two dissimilar sounds.

4. IDENTIFY objects or events in the environment by the sounds they make, to demonstrate that sounds can carry messages.

Context:

Using paper, books, marbles, pencils, bells, and piano, children compare, identify, and interpret sounds.

Vocabulary:

Sound, silence, listen, hear, loud, soft, high, low, long, short

Observing 5 - OBSERVING COLOR CHANGES

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY and NAME a colored object by comparing it with a different kind of object that has the same color.

2. NAME the observed change in color after he has observed such change.

Context:

Children use colored water, colored paper, crayons, and chemicals.

Vocabulary:

Yellow, red, blue, green, color, change, mix, mixture, solution

Observing 6 - OBSERVING SOLIDS CHANGING TO LIQUIDS

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY and NAME the changes which occur when a solid changes to a liquid, including changes in properties such as height, width, color, temperature, and shape.

2. DISTINGUISH between solid objects which melt and those which do not melt, under specified conditions.

Context:

Children use clay, butter, ice, and candles to observe changes.

Vocabulary:

Melt, melting, hotter, cooler, faster, slower, solid (solidify), liquid (liquefy), first, second, last

Observing 7 - PERCEPTION OF ODOR

Objectives:

At the end of this exercise the child should be able to

1. DISTINGUISH between objects that have an odor and those that do not.

2. IDENTIFY groups of objects as having similar or different odors.

Context:

Children work with perfumed cloth, water, alcohol, vinegar, and foods to sharpen odor perception.

Vocabulary:

Odor, odorless, perfume

Observing 8 - PERCPETION OF TASTE

Objectives:

At the end of this exercise the child should be able to

1. DISTINGUISH between certain food tastes as similar to, or different from, each other.

2. IDENTIFY tastes that are sweet, sour, or salty.

Context:

Using bread (with sugar, salt, and lemon), lemonade, and other foods, children perceive and classify tastes.

Vocabulary:

Taste, sweet, sour, salty

PART B (1, 2)

Observing 9 - OBSERVATION, USING SEVERAL OF THE SENSES

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY objects, or changes in objects, by using several of the senses.

2. IDENTIFY which sense or senses he used to make his observations, by saying, for example, "I smelled it," "I saw it," and so on.

Context:

Children work with popcorn (popped and unpopped) and cookies (baked and not baked).

Vocabulary:

Most of the pertinent words used here have been used in earlier exercises in Part A. However, such words as explode, expand, compress, and pressure may also come up in the discussion, if the children are curious and ask questions.

Observing 10 - OBSERVING THE WEATHER

Objectives:

At the end of this exercise the child should be able to

1. CONSTRUCT and DEMONSTRATE the use of a record of weather conditions on a chart, using standard symbols, and NAME these recorded symbols.

2. DISTINGUISH between the weather conditions on two days by examining the weather chart.

3. DISTINGUISH weather conditions from day to day in comparative terms such as "hotter or warmer than,"

"cooler than," "windier than," or "cloudier than," using the data recorded on the weather chart.

4. NAME the temperature in degrees, using a simple thermometer.

Context:

Using a chart, children daily describe weather conditions.

Vocabulary:

Weather, climate, clouds, cloudy, overcast, wind, calm, breezy, windy, fog, snow, smog, dust storm, frost (use terms appropriate to your locale.)

The following terms were introduced in Observing 3 and should be reviewed: thermometer, temperature, warmer, cooler, higher, lower, earlier, later.

Observing 11 - OBSERVING SOME PROPERTIES OF MAGNETS

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY a metal object of any shape or size as a possible magnet.

2. IDENTIFY objects which are magnets by demonstrating their effect upon various metals.

Context:

Children use horseshoe and bar magnets to work with paper clips, nails, wood, paper, tacks, etc.

Vocabulary:

Magnet, weaker, magnetism, stronger, test.

Observing 12 - OBSERVING COLOR AND COLOR CHANGES IN PLANTS

Objectives:

At the end of this exercise the child should be able to

1. DESCRIBE changes in the color of an object when the change occurs within a short time (a few minutes or less).

2. IDENTIFY the observed change in color as being caused by the addition of another substance.

Context:

Children use red cabbage and cook it with water, vinegar, ammonia, and baking soda.

Vocabulary:

Vinegar, baking soda, ammonia, litmus

Observing 13 - OBSERVING MOLD GARDENS

Objectives:

At the end of this exercise the child should be able to

1. DESCRIBE the color, shape, and size of a few kinds of molds.

2. IDENTIFY from a group those materials that can support the growth of molds and those that cannot.

Context:

Children construct "gardens" of soil and leaves and "plant" orange rind, peach skin, bread, chalk, thumbtacks, pencils, etc.

Vocabulary:

Mold, spore, colony, fungus

PART C (2, 3)

Observing 14 - OBSERVING ANIMAL MOTION

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY the kinds of locomotion possible in animals of various shapes and with various kinds of appendages.

2. DEMONSTRATE the characteristic "push" common to animals that walk or crawl.

Context:

Using frogs, toads, hamsters, turtles, guppies, an earthworm and snake, children observe animal motion.

Vocabulary:

Push, propel, locomotion, names of animals used in the activities

Observing 15 - OBSERVING ANIMAL RESPONSES TO STIMULI

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY stimuli in the environment of an animal.

2. IDENTIFY the animal's responses to identified stimuli.

Context:

Children use fish (guppies) and turtles as responding subjects to sound, light, heat, and other stimuli.

Vocabulary:

Stimulus (stimuli, plural form), response

Observing 16 - MAGNETIC POLES

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY and NAME the north- and south-seeking poles of a magnet.

2. IDENTIFY the interactions of two objects (in this case, magnets) that can be observed indirectly.

3. IDENTIFY changes in a property of an electromagnet that can be observed indirectly.

Context:

Using marked and unmarked bar magnets and metal bars, children work with iron filings, paper clips, and other materials.

Vocabulary:

Iron core, electromagnet, pole, attraction, repulsion, magnetic field, coil, attract, repel, indirect observation.

Observing 17 - OBSERVING GROWTH FROM SEEDS

Objectives:

At the end of this exercise the child should be able to

1. ORDER the germination rates of various seeds.

2. ORDER the growth rates of different parts of the root, stem, or leaf of a plant.

3. DESCRIBE a procedure for determining whether or not a plant or a plant part is growing uniformly.

Context:

Children work with corn, radish, bean, and sunflower seeds.

Vocabulary:

Germinate, germination, seedling, plant, root, emerge, vermiculite

Observing 18 - OBSERVING FALLING OBJECTS

Objectives:

At the end of this exercise the child should be able to

1. DISTINGUISH whether or not two objects dropped from the same height and at the same time strike the floor at about the same time.

2. IDENTIFY possible causes of observed differences in falling times of objects that do not strike the floor at the same time when dropped simultaneously from the same height.

Context:

Children use such items as marbles, stones, different kinds of balls, cubes, clay, cotton, paper wads, etc.

Vocabulary:

Resistance, vacuum

Duplicated Materials -- With Answers

OB #1

Code _____

PRE-APPRAISAL

TASK I: Using the object given you, write seven properties of the object.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

TASK II. Based on what you have seen in the filmed episode, please construct two statements of <u>observation</u>:

1. _____

2. _____

Construct two statements of <u>inference</u>:

1. _____

2. _____

Code_____

Which of the following statements are observations? Which are inferences? Circle O if you think the statement is an observation; circle I if you think it is an inference.

The ground is wet.	(O)	I
The tricycle has water drops on it.	(O)	I
It rained while we were sleeping.	O	(I)
Mother watered the lawn.	O	(I)

Which senses did Andrew and Mike use to make the observations?

Sight

What would you do to find out which boy is right in the inference he made?

Try to get more information -- for instance:

examine the yard next door;
see if the hose is wet;
ask Mother.

Code _____

Which statements are observations? Which are inferences? Circle O if you think the statement is an observation; circle I if you think the statement is an inference.

The tricycle felt wet.	(O)	I
Now it is dry.	(O)	I
The water evaporated. It went into the air.	O	(I)
Mother dried the tricycle.	O	(I)

What kinds of observations were made? Circle the senses used:

(seeing), smelling, (feeling), hearing, tasting.

OB #5

Code_____

Circle O if you think the statement is an observation; circle I if you think it is an inference.

I hear a noise.	(O)	I
I hear clomp, clomp.	(O)	I
It must be Dad.	O	(I)
It could be the mailman.	O	(I)

What kinds of observations were made? Circle the senses used:

seeing, smelling, feeling, (hearing,) tasting.

OB #6

Code_____

Circle O if you think the statement is an observation; circle I if you think it is an inference.

I hear Mom's voice.	(O)	I
Mom is singing.	(O)	I
It sounds louder.	(O)	I
She must be getting closer.	O	(I)
Mom must be singing louder.	O	(I)

What kinds of observations were made? Circle the senses used:

seeing, smelling, feeling, (hearing,) tasting.

03 #7

Code_____

APPRAISAL

Task I: Using the object given you, write seven properties of the object.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

TASK II: Based on what you have seen in the filmed episode, please construct two statements of <u>observation</u>:

1. _____

2. _____

Construct two statements of <u>inference</u>:

1. _____

2. _____